

PCT

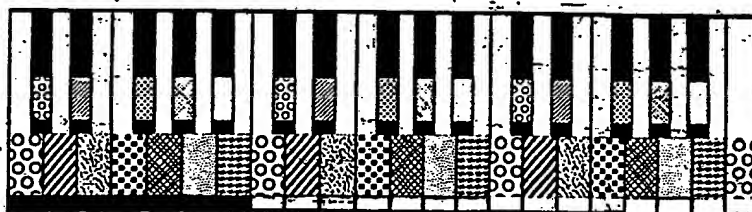
WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification³: G10G 1/00, 1/02; A63J 17/00</p>	<p>A1</p>	<p>(11) International Publication Number: WO 81/00637 (43) International Publication Date: 5 March 1981 (05.03.81)</p>
<p>(21) International Application Number: PCT/AU80/00052 (22) International Filing Date: 27 August 1980 (27.08.80) (31) Priority Application Number: PE 0211 (32) Priority Date: 27 August 1979 (27.08.79) (33) Priority Country: AU (71) Applicant; and (72) Inventor: LOUEZ, Nigel, Robert [AU/AU]; 111 Belmont Road, Mosman, N.S.W. 2088 (AU).</p>		<p>(81) Designated States: AT (European patent), AU, BR, CH (European patent), DE (European patent), FR (European patent), GB, JP, LU (European patent), NL (European patent), SE (European patent), US. Published With international search report.</p>

(54) Title: METHOD OF REPRESENTING SOUND BY COLOUR



(57) Abstract

A visual method of representing sound by colour consisting of dividing the colour spectrum into twelve hues and correlating each of the twelve notes of the musical octave with each hue in such a way that degrees of consonance and dissonance between notes correlate with that between the corresponding colours with a high degree of fidelity. A further refinement of this method is to represent ascending octaves of colours so correlated by ascending colour value so that the higher octaves are represented by pastel colours and the lower octaves by dark (i.e. low value) colours. Yet a further refinement of the method is to represent sounds corresponding to the superposition of a number of notes by the admixture of the colours corresponding to those notes. A refinement of the method when applied to a dynamic visual colour display is to represent an increase in intensity of the sound by an increase in the area of the colour of the display.

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METHOD OF REPRESENTING SOUND BY COLOUR

This invention relates to visual methods of representing sound involving colour. Attempts have been made to translate sound into visual displays of changing colour patterns. In some cases a relationship has been established between sound waves and light waves. However the available apparatus has not been well received owing to the poor fidelity of visual representation of the sound. It is an object of this invention to provide a high fidelity representation of sound by colour.

10 In one form the method of this invention consists in dividing the colour spectrum into twelve hues and correlating each of the twelve notes of the musical octave with each hue in such a way that degrees of consonance and dissonance between notes correlate with that between the corresponding colours with a high degree of fidelity. A further refinement of this method is to represent ascending octaves of colours so correlated by ascending colour value so that the higher octaves are represented by pastel colours and the lower octaves by dark (i.e. low value) colours.

20 Yet a further refinement of the method is to represent sounds corresponding to the superposition of a number of notes by the admixture of the colours corresponding to those notes. A refinement of the method when applied to a dynamic visual colour display is to represent an increase in intensity of the sound by an increase in the area of the colour of the display.

25 Following is an elaboration of the method with a



reference to the accompanying diagrams in which:

Figure 1 is a colour circle showing a preferred correlation between the natural spectral order and the cycle of 5ths of the musical octave.

5 Figure 2 is a colour circle showing another correlation between the natural spectral order and the cycle of 5ths of the musical octave.

Figure 3 is a keyboard showing the correlation of Figure 1.

Figure 4 is a keyboard showing the correlation of Figure 2.

10 In Figure 1 C is represented by a solid yellow, G by solid yellow and fifty percent magenta, D by solid yellow and solid magenta, A by fifty percent yellow and solid magenta, E by solid magenta, B by fifty percent cyan and solid magenta, F sharp, G flat by solid cyan and solid
15 magenta, C sharp, D flat by solid cyan and fifty percent magenta, G sharp, A flat by solid cyan, D sharp, E flat by fifty percent yellow and solid cyan, A sharp, D flat by solid yellow and solid cyan, and F by solid yellow and fifty percent cyan. In Figure 2 C is represented by solid
20 cyan and solid magenta and the other colours are correlated with the other notes in an order opposite to that of Figure 1. In fact the starting point of correlating the note C is quite arbitrary and the method encompasses all possible correlations between the order of notes
25 shown, in both Figures 1 and 2, and the order of the hues of the natural colour spectrum.

Figures 3 and 4 show the correlated colours of



Figures 1 and 2 respectively, set out on keyboards. They also illustrate another aspect of the invention, viz. ascending octaves of colour are represented by ascending colour value. The lower octaves on the left of the
5 keyboards are marked with the colours of Figures 1 and 2 which are deep colours, while those on the right are marked with pastel colours which have had white added. Three octaves only are shown in Figures 3 and 4 but the method can be applied to the whole piano keyboard so that
10 the lowest octave is represented by extremely dark colours and the highest octave by extremely light colours.

Whereas individual notes are represented by the particular colours shown, a number of notes sounded at the same time are represented by a mixture of those colours.
15 A unique aspect of the method of the invention is that in nearly all cases the mixture of colours corresponding to consonant notes results in another pure colour whereas the mixture of colours corresponding to dissonant notes results in a murky or grey colour. Hence the colours represent
20 the sounds with high fidelity which is not achieved in the various arbitrary correlations of sound and colour used previously.

A preferred application of the method resides in displaying sound on a dynamic visual display such as a
25 colour television screen. Here the intensity of different notes is indicated by the area of the screen occupied by the colour corresponding to those notes. Various ways of



achieving this result are feasible. Such as by:-

- (a) A uni-directional vertical expansion of a horizontal bar upon a portion of the screen.
- (b) A bi-directional vertical expansion of a horizontal bar.
- (c) From a single point bi-directional both horizontal and vertical expansion.
- (d) A plurality of expanding colour displays referred to in (a) to (c) above in individually assigned areas on the screen.
- (e) Concentrically arranged areas assigned to respective hues having both vertical and horizontal expansion and capable of overlapping.

The method of this invention also has other applications. It may be used in the teaching of musical instruments. By affixing correlated colours to keys or positions on a guitar stock for example, and annotating the musical score in the same manner, students have an immediate visual guide to their playing which is not mediated by the naming of the musical notes. Although this method of teaching musical instruments is already known for quite arbitrary colour correlations, the unique correlations of the method of this invention are much more effective. This and other applications are possible which embody the basic method of this invention.



The claims defining the invention are as follows:

1. A method of representing sound by colour in which the colour spectrum is divided into twelve hues each of which is correlated with each of the twelve notes of a musical octave in such a way that degrees of consonance and dissonance between notes correlate with that between corresponding colours, with a high degree of fidelity.
2. The method of claim 1 in which the natural spectral order of the twelve hues is correlated with the cycle of 5ths.
3. The method of claim 1 in which the notes of ascending octaves are represented by hues of ascending colour value and those of descending octaves are represented by descending colour value.
4. The method of claim 1 in which sounds corresponding to the superposition of a number of notes are represented by a mixture of the colours corresponding to those notes.
5. The method of claim 4 in which a mixture results from partitive mixing.
6. The method of claim 1 when applied to a dynamic visual colour display in which an increase in the intensity of the sound is represented by an increase in the area of the display.
7. The method of claim 7 when applied to a television screen in which the intensity of notes is



represented by concentric areas of colour on the screen.

8. A method of representing sound by colour as herein described with reference to the accompanying diagrams.

5

10



figure 1

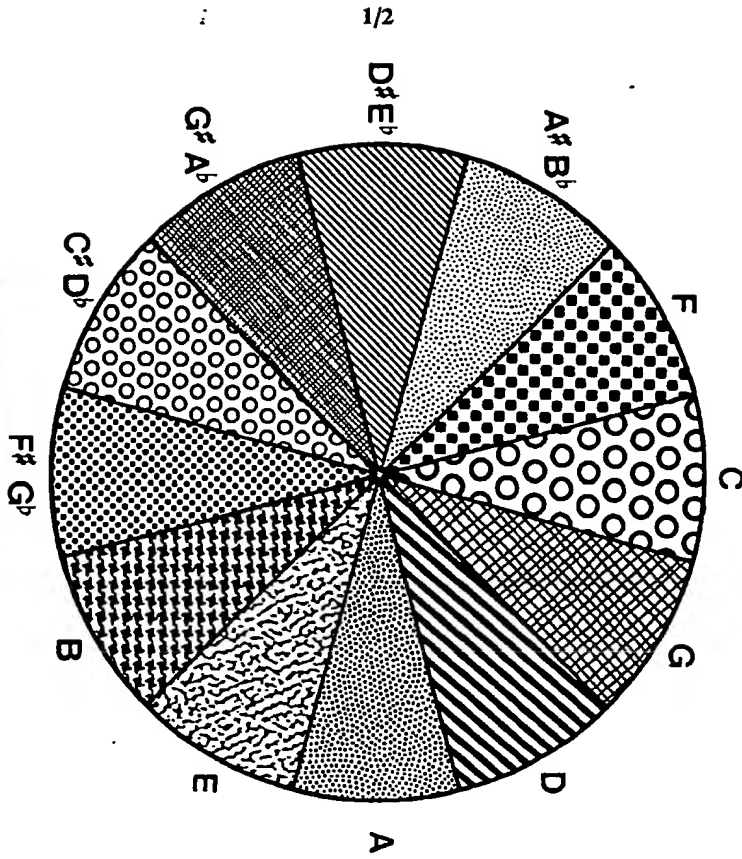


figure 2

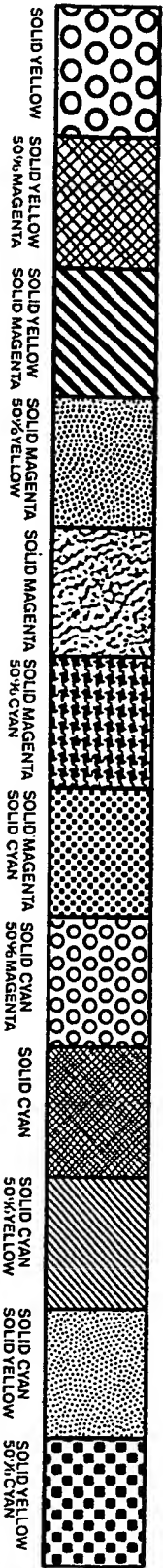
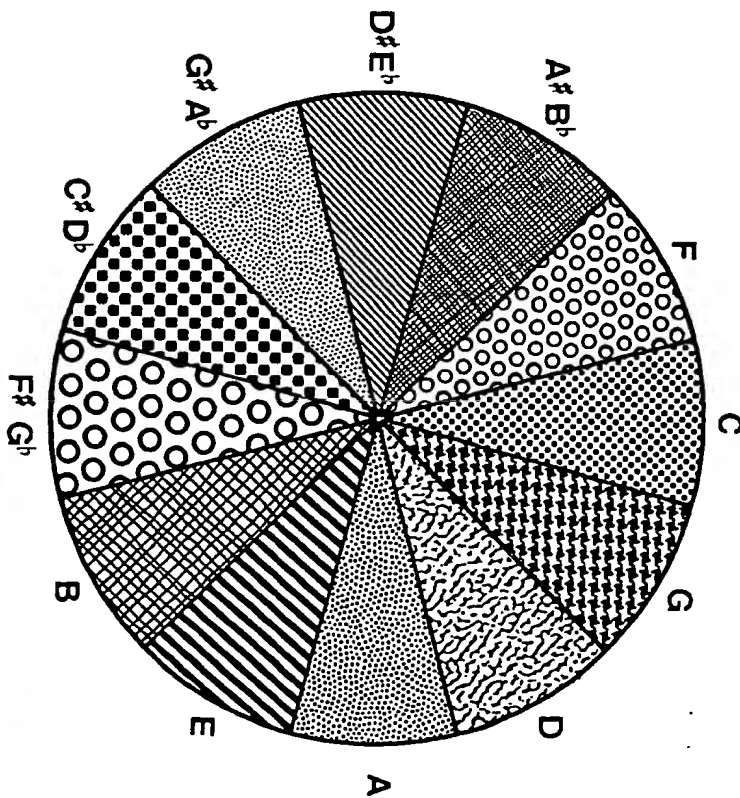


figure 3

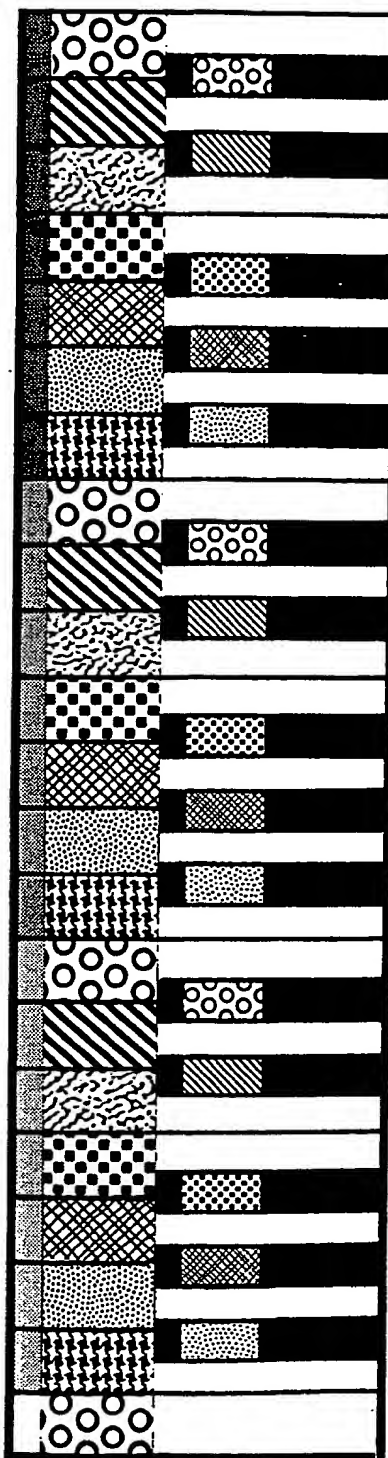
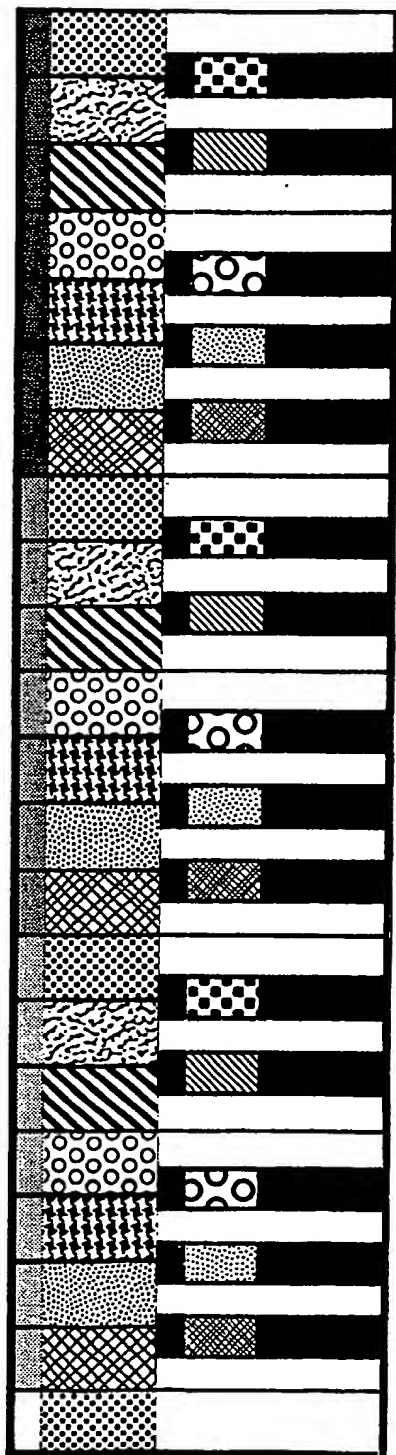


figure 4



INTERNATIONAL SEARCH REPORT

International Application No PCT/AU 80/00052

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³ According to International Patent Classification (IPC) or to both National Classification and IPC Int. Cl ³ . G10G 1/00, 1/02, A63J 17/00																																			
II. FIELDS SEARCHED <div style="text-align: center;">Minimum Documentation Searched ⁴</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 20%;">Classification System</th> <th>Classification Symbols</th> </tr> <tr> <td style="text-align: center; vertical-align: top;">IPC</td> <td>G10G 1/00, 1/02, A63J 17/00, G09B 15/08</td> </tr> </table> <div style="text-align: center; margin-top: 5px;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵</div> <p style="margin-top: 10px;">AU : IPC as above; Australian Classification 53.431</p>			Classification System	Classification Symbols	IPC	G10G 1/00, 1/02, A63J 17/00, G09B 15/08																													
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III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴ <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category *</th> <th style="width: 60%;">Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷</th> <th style="width: 30%;">Relevant to Claim No. ¹⁸</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">X</td> <td>AU, B, 4075/37, published 1938, September 20, see column 2, lines 15 to 21, Hector.</td> <td style="text-align: center;">(1-6)</td> </tr> <tr> <td style="text-align: center;">X</td> <td>AU, B, 2810/26, published 1926, August 18, Hector</td> <td style="text-align: center;">(1)</td> </tr> <tr> <td style="text-align: center;">X</td> <td>AU, B, 14710/44(122640), published 1946, November 14, see column 1, lines 9 to 16, and column 4, lines 3 to 7, Hartley.</td> <td style="text-align: center;">(1,4,6)</td> </tr> <tr> <td style="text-align: center;">X</td> <td>DE, A, 1109030, published 1961, June 15, Combastet.</td> <td style="text-align: center;">(1-6)</td> </tr> <tr> <td style="text-align: center;">X</td> <td>DE, A, 397587, published 1924, July 1, Artus-Perrelet.</td> <td style="text-align: center;">(1-6)</td> </tr> <tr> <td style="text-align: center;">X</td> <td>GB, A, 1184697, published 1970, March 18, Cameron.</td> <td style="text-align: center;">(1)</td> </tr> <tr> <td style="text-align: center;">X</td> <td>GB, A, 222006, published 1924, September 25, Desirello.</td> <td style="text-align: center;">(1)</td> </tr> <tr> <td style="text-align: center;">X</td> <td>US, A, 2807183, published 1957, September 24, Ney.</td> <td style="text-align: center;">(1)</td> </tr> <tr> <td style="text-align: center;">X</td> <td>US, A, 2221143, published 1940, November 12, Lang.</td> <td style="text-align: center;">(1)</td> </tr> <tr> <td style="text-align: center;">X</td> <td>US, A, 2236638, published 1941, April 1, Adams. (continued on supplementary sheet).</td> <td style="text-align: center;">(1)</td> </tr> </tbody> </table>			Category *	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸	X	AU, B, 4075/37, published 1938, September 20, see column 2, lines 15 to 21, Hector.	(1-6)	X	AU, B, 2810/26, published 1926, August 18, Hector	(1)	X	AU, B, 14710/44(122640), published 1946, November 14, see column 1, lines 9 to 16, and column 4, lines 3 to 7, Hartley.	(1,4,6)	X	DE, A, 1109030, published 1961, June 15, Combastet.	(1-6)	X	DE, A, 397587, published 1924, July 1, Artus-Perrelet.	(1-6)	X	GB, A, 1184697, published 1970, March 18, Cameron.	(1)	X	GB, A, 222006, published 1924, September 25, Desirello.	(1)	X	US, A, 2807183, published 1957, September 24, Ney.	(1)	X	US, A, 2221143, published 1940, November 12, Lang.	(1)	X	US, A, 2236638, published 1941, April 1, Adams. (continued on supplementary sheet).	(1)
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<div style="display: flex; justify-content: space-between; font-size: small;"> <div> <p>* Special categories of cited documents: ¹⁵</p> <p>"A" document defining the general state of the art</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document cited for special reason other than those referred to in the other categories</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> </div> <div> <p>"P" document published prior to the international filing date but on or after the priority date claimed</p> <p>"T" later document published on or after the international filing date or priority date and not in conflict with the application, but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance</p> </div> </div>																																			
IV. CERTIFICATION <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top;"> Date of the Actual Completion of the International Search ¹ 13 October 1980 (13.10.80) </td> <td style="width: 50%; vertical-align: top;"> Date of Mailing of this International Search Report ² 12 November 1980 (12.11.80) </td> </tr> <tr> <td style="vertical-align: top;"> International Searching Authority ¹ AUSTRALIAN PATENT OFFICE </td> <td style="vertical-align: top;"> Signature of Authorized Officer ²⁰ <div style="display: flex; align-items: center;"> <div> <p style="margin: 0;">A.S. Moore.</p> </div> </div> </td> </tr> </table>			Date of the Actual Completion of the International Search ¹ 13 October 1980 (13.10.80)	Date of Mailing of this International Search Report ² 12 November 1980 (12.11.80)	International Searching Authority ¹ AUSTRALIAN PATENT OFFICE	Signature of Authorized Officer ²⁰ <div style="display: flex; align-items: center;"> <div> <p style="margin: 0;">A.S. Moore.</p> </div> </div>																													
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FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

X	US, A, 1577854, published 1926, March 23, Vinegeras.	(1)
X	US, A, 1432552, published 1922, October 17, Hector.	(1-6)
X	US, A, 1432553, published 1922, October 17, Hector.	(1-6)
X	FR, A, 788335, published 1935, October 8, David.	(1-6)
X	FR, A, 590288, published 1925, June 13, Schmeer.	(1)

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE ¹⁰

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers because they relate to subject matter ¹² not required to be searched by this Authority, namely:

2. ☐ Claim numbers because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out ¹³, specifically:

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING ¹¹

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.
☐ No protest accompanied the payment of additional search fees.